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# Commentary

# Formalin-fixed paraffin-embedded tissue: The holy grail of clinical proteomics

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Tissue is the most relevant biological material to gather insight in disease mechanisms by means of omics technologies. However, fresh frozen tissue, which is generally regarded as the best imaginable source for such studies, is often not available. In case it is available, the different ways of storage (e.g. −20°C, −80°C, liquid nitrogen, etc.) hamper the conduction of reproducible multicenter studies because of different protein degradation rates. Formalin-fixed paraffin-embedded (FFPE) tissue on the contrary is considered as a valuable alternative for fresh frozen tissue, because only a few standard operation procedures are applied worldwide for the preparation of these tissues and because they are all stored in the same way. However, a study on the impact of the different preparation protocols for FFPE tissue was still lacking. Therefore, Bronsert et al. in this issue [Bronsert, P., Weißer, J., Biniossek, M. L., Kuehs, M. et al., Proteomics Clin. Appl. 2014] conducted such a study that provides proof that there is no significant effect between these sample preparations procedures, and thereby they further open the gate for FFPE tissues to enter the field of clinical proteomics.

**Keywords:**
Biomarkers / Cancer / Tissue proteomics

High-quality collections of biological samples are essential to gain both fundamental insights in disease mechanisms as well as in more applied research leading to the identification of potential biomarkers. Although frozen biobanked material is very popular, the limited availability of these tissues restricts their use in clinical research. FFPE tissue offers a good alternative to frozen material, but has been left aside by proteomics researchers for decades, because of the inherent difficulties associated with the extraction of the proteins and artificial modifications that are induced by the fixation process. However, FFPE tissues form an interesting source of clinical samples for several reasons: (i) there is a general long patient follow-up history, (ii) FFPE tissues are routinely prepared for pathological analysis worldwide, (iii) these tissue collections offer the best chances to obtain large cohorts of samples over a short period of time. For all these reasons, many attempts have been made recently to extract proteins from FFPE tissues for proteomics analysis.

Efforts leading toward better practices for the extraction, separation, MS analysis, and bioinformatics interpretation of FFPE tissue based proteomics are still highly demanded. Although the number of publications related to the proteomic analysis of FFPE tissues have significantly increased during the past years (Fig. 1), additional technological improvements for the exploitation of this rich source of tissues for clinical proteomics purposes are still required. Therefore, efforts such as described in the article by Bronsert and co-workers in this issue of *Proteomics Clinical Applications* [1] are highly appreciated and form the basis for future proteomics research on FFPE tissues. The knowledge that the different routinely employed procedures for the preparation of FFPE tissues do not influence downstream proteomics analysis is an important insight that will further enhance research in this field.

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**Abbreviation: FFPE**, formalin-fixed paraffin-embedded

*These authors have contributed equally to this work.

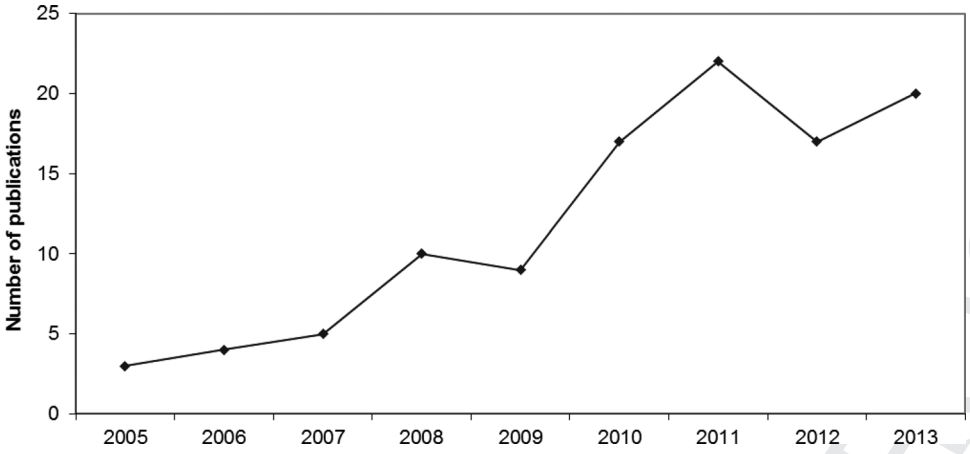


**Figure 1.** Number of publications regarding proteomics studies on FFPE tissues (source: PubMed).

Additional insights regarding the extraction, separation, analysis, and bioinformatics interpretation of FFPE-based proteomics are however still required to enable the full exploitation of these tissues before they might be considered as the holy grail of clinical proteomics.

## Reference

[1] Bronsert, P., Weißer, J., Biniossek, M. L., Kuehs, M. et al., *Proteomics Clin. Appl.* 2014.

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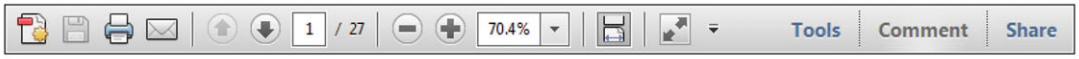


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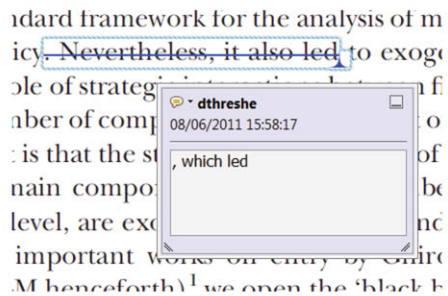


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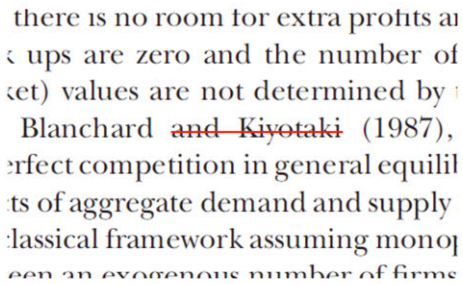

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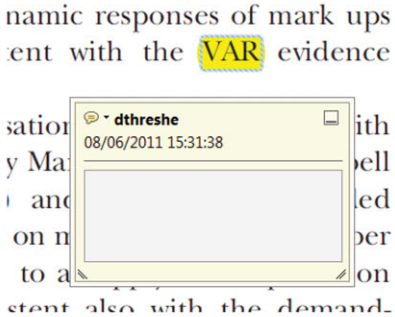


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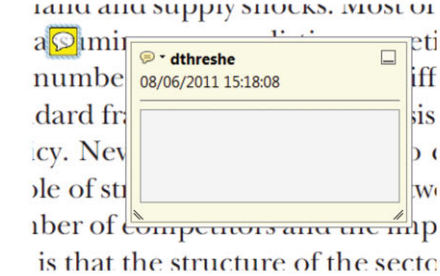

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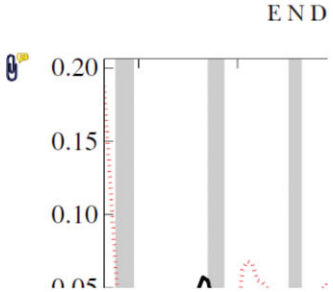


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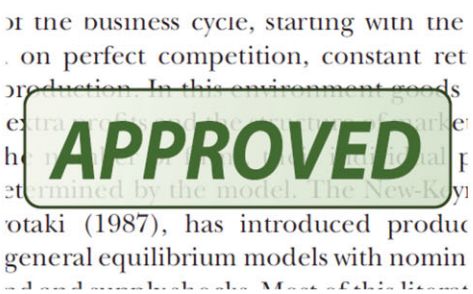


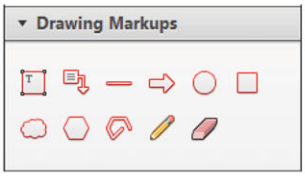


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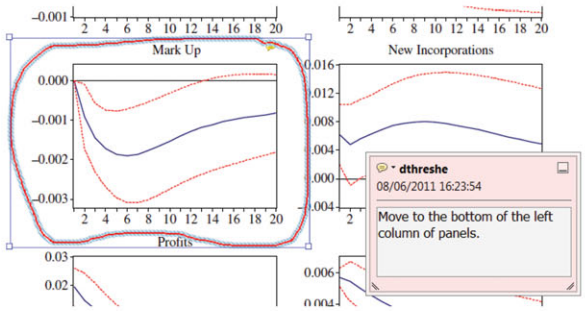


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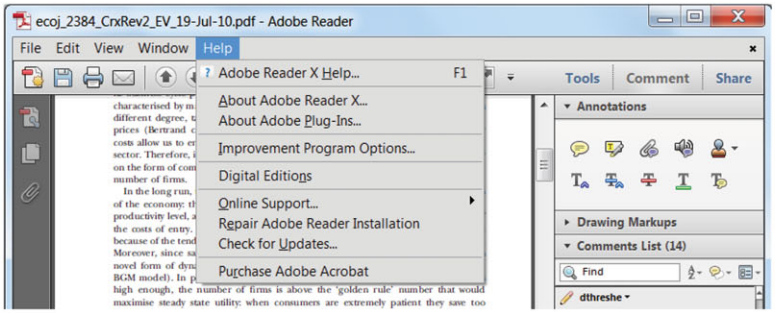

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